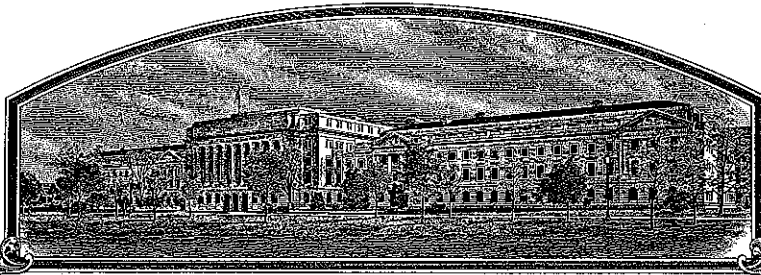


No.

200600107



# THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

NSA Research Foundation

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBERS OF GENERATIONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT, DURUM

'Grenora'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this fifth day of July, in the year two thousand and six.

Attest:

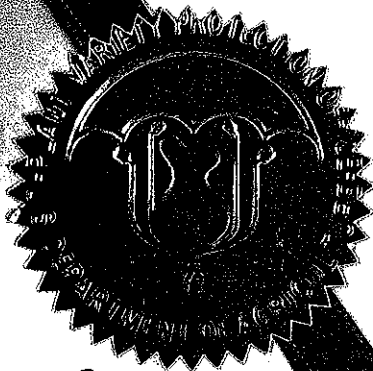
*[Signature]*

Commissioner

Plant Variety Protection Office  
Agricultural Marketing Service

*[Signature]*

Secretary of Agriculture



**U.S. DEPARTMENT OF AGRICULTURE**  
**AGRICULTURAL MARKETING SERVICE**  
**SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE**

**APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE**  
*(Instructions and information collection burden statement on reverse)*

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

<b>1. NAME OF OWNER</b> NDSU Research Foundation		<b>2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME</b> D97780	<b>3. VARIETY NAME</b> 'Grenora'								
<b>4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)</b> C/O Executive Director PO Box 5002 1735 NDSU Research Park Drive Fargo, ND 58105-5002		<b>5. TELEPHONE (include area code)</b> (701) 231-8931	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th align="center" colspan="2">FOR OFFICIAL USE ONLY</th> </tr> <tr> <td style="width:50%;"><b>PVPO NUMBER</b></td> <td style="width:50%; text-align: center; font-size: 1.5em;">200600107</td> </tr> <tr> <td colspan="2"><b>FILING DATE</b></td> </tr> <tr> <td colspan="2" style="text-align: center; font-size: 1.2em;">Feb. 13, 2006</td> </tr> </table>	FOR OFFICIAL USE ONLY		<b>PVPO NUMBER</b>	200600107	<b>FILING DATE</b>		Feb. 13, 2006	
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<b>PVPO NUMBER</b>	200600107										
<b>FILING DATE</b>											
Feb. 13, 2006											
<b>6. FAX (include area code)</b> (701) 231-6661	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:50%;"><b>FILING AND EXAMINATION FEES:</b></td> <td style="width:50%; text-align: right;">\$ 4382.00</td> </tr> <tr> <td><b>DATE</b></td> <td style="text-align: right;">2/13/2006</td> </tr> <tr> <td><b>CERTIFICATION FEE:</b></td> <td style="text-align: right;">\$ 768.<sup>00</sup></td> </tr> <tr> <td><b>DATE</b></td> <td style="text-align: right;">5/18/2006</td> </tr> </table>	<b>FILING AND EXAMINATION FEES:</b>	\$ 4382.00	<b>DATE</b>	2/13/2006	<b>CERTIFICATION FEE:</b>	\$ 768. <sup>00</sup>	<b>DATE</b>	5/18/2006		
<b>FILING AND EXAMINATION FEES:</b>		\$ 4382.00									
<b>DATE</b>	2/13/2006										
<b>CERTIFICATION FEE:</b>	\$ 768. <sup>00</sup>										
<b>DATE</b>	5/18/2006										
<b>7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.)</b> NDSU Research Foundation	<b>8. IF INCORPORATED, GIVE STATE OF INCORPORATION</b> ND	<b>9. DATE OF INCORPORATION</b> May-1989									
<b>10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. (First person listed will receive all papers)</b> <table style="width:100%;"> <tr> <td style="width:50%; vertical-align: top;"> Elias Elias  Department of Plant Sciences  North Dakota State University  PO Box 5051  Fargo, ND 58105-5051 </td> <td style="width:50%; vertical-align: top;"> Dale Zetocha  Executive Director  NDSU Research Foundation  PO Box 5002  1735 NDSU Research Park Drive  Fargo, ND 58105-5002 </td> </tr> </table>				Elias Elias Department of Plant Sciences North Dakota State University PO Box 5051 Fargo, ND 58105-5051	Dale Zetocha Executive Director NDSU Research Foundation PO Box 5002 1735 NDSU Research Park Drive Fargo, ND 58105-5002						
Elias Elias Department of Plant Sciences North Dakota State University PO Box 5051 Fargo, ND 58105-5051	Dale Zetocha Executive Director NDSU Research Foundation PO Box 5002 1735 NDSU Research Park Drive Fargo, ND 58105-5002										
<b>11. TELEPHONE (include area code)</b> (701) 231-8159	<b>12. FAX (include area code)</b> (701) 231-8474	<b>13. E-MAIL</b> elias.elias@ndsu.edu    dzetocha@ndsurf.org									
<b>14. CROP KIND (Common Name)</b> Durum wheat	<b>16. FAMILY NAME (Botanical)</b> Gramineae	<b>18. DOES THE VARIETY CONTAIN ANY TRANSGENES? (OPTIONAL)</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF SO, PLEASE GIVE THE ASSIGNED USDA-APHIS REFERENCE NUMBER FOR THE APPROVED PETITION TO DEREGULATE THE GENETICALLY MODIFIED PLANT FOR COMMERCIALIZATION.									
<b>15. GENUS AND SPECIES NAME OF CROP</b> Triticum Turgidum L. var. durum	<b>17. IS THE VARIETY A FIRST GENERATION HYBRID?</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? (See Section 63(a) of the Plant Variety Protection Act)</b> <input checked="" type="checkbox"/> YES (if "yes", answer items 21 and 22 below) <input type="checkbox"/> NO (if "no", go to item 23)									
<b>19. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse)</b> a. <input checked="" type="checkbox"/> Exhibit A. Origin and Breeding History of the Variety b. <input checked="" type="checkbox"/> Exhibit B. Statement of Distinctness c. <input checked="" type="checkbox"/> Exhibit C. Objective Description of Variety d. <input checked="" type="checkbox"/> Exhibit D. Additional Description of the Variety (Optional) e. <input checked="" type="checkbox"/> Exhibit E. Statement of the Basis of the Owner's Ownership f. <input checked="" type="checkbox"/> Voucher Sample (2,500 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository) g. <input checked="" type="checkbox"/> Filing and Examination Fee (\$4,382.), made payable to "Treasurer of the United States" (Mail to the Plant Variety Protection Office)		<b>21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES?</b> <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO IF YES, WHICH CLASSES? <input checked="" type="checkbox"/> FOUNDATION <input checked="" type="checkbox"/> REGISTERED <input checked="" type="checkbox"/> CERTIFIED									
<b>23. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES?</b> <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. (Please use space indicated on reverse.)		<b>22. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, SPECIFY THE NUMBER 1,2,3, etc. FOR EACH CLASS. <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED (If additional explanation is necessary, please use the space indicated on the reverse.)									
<b>24. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT (PLANT BREEDER'S RIGHT OR PATENT)?</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. (Please use space indicated on reverse.)		<b>25. THE OWNERS DECLARE THAT A VIABLE SAMPLE OF BASIC SEED OF THE VARIETY HAS BEEN FURNISHED WITH APPLICATION AND WILL BE REPLENISHED UPON REQUEST IN ACCORDANCE WITH SUCH REGULATIONS AS MAY BE APPLICABLE, OR FOR A TUBER PROPAGATED VARIETY A TISSUE CULTURE WILL BE DEPOSITED IN A PUBLIC REPOSITORY AND MAINTAINED FOR THE DURATION OF THE CERTIFICATE.</b> The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act. Owner(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.									

SIGNATURE OF OWNER

SIGNATURE OF OWNER

NAME (Please print or type)

NAME (Please print or type)

CAPACITY OR TITLE

DATE

CAPACITY OR TITLE

DATE

Executive Director  
NDSU Research Foundation

2/10/06

**GENERAL:** To be effectively filed with the Plant Variety Protection Office (PVPO), **ALL** of the following items must be **received** in the PVPO: (1) Completed application form signed by the owner; (2) completed exhibits A, B, C, E; (3) for a seed reproduced variety at least 2,500 viable untreated seeds, for a hybrid variety at least 2,500 untreated seeds of each line necessary to reproduce the variety, or for tuber reproduced varieties verification that a viable (*in the sense that it will reproduce an entire plant*) tissue culture will be deposited and maintained in an approved public repository; (4) check drawn on a U.S. bank for \$3,652 (\$432 filing fee and \$3,220 examination fee), payable to "Treasurer of the United States" (See Section 97.6 of the Regulations and Rules of Practice.) Partial applications will be held in the PVPO for not more than 90 days, then returned to the applicant as unfilled. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 401, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a check payable to "Treasurer of the United States" in the amount of \$432 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

**Plant Variety Protection Office**

**Telephone: (301) 504-5518**

**FAX: (301) 504-5291**

**Homepage:** <http://www.ams.usda.gov/science/pvpo/pvpindex.htm>

To avoid conflict with other variety names in use, the applicant must check the appropriate recognized authority and provide evidence that name has been cleared by the appropriate recognized authority before the Certificate of Protection is issued. For example, for agricultural and vegetable crops, contact: Seed Branch, AMS, USDA, 10301 Baltimore Avenue, Suite 401 NAL Building, Beltsville, MD 20705. Telephone: (301) 504-5682 <http://www.ams.usda.gov/lsg/seed.htm>.

## ITEM

- 19a. Give: (1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method;  
(2) the details of subsequent stages of selection and multiplication;  
(3) evidence of uniformity and stability; and  
(4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified
- 19b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:
- (1) identify these varieties and state all differences objectively;
  - (2) attach statistical data for characters expressed numerically and demonstrate that these are clear differences; and
  - (3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.
- 19c. Exhibit C forms are available from the PVPO Office for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.
- 19d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, etc.
- 19e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.
20. If "Yes" is specified (*seed of this variety be sold by variety name only, as a class of certified seed*), the applicant **MAY NOT** reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. (See Regulations and Rules of Practice, Section 97.103).
23. See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.
24. See Section 55 of the Act for instructions on claiming the benefit of an earlier filing date.

## 22. CONTINUED FROM FRONT (Please provide a statement as to the limitation and sequence of generations that may be certified.)

## 23. CONTINUED FROM FRONT (Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)

USA named and released as a cultivar June 1, 2005.

Seed will be first distributed to ND County Crop Improvement in the spring of 2006. Grenora was first tested under a Material Transfer Agreement in the United States dated May, 20, 2003. Material transfer agreements have been used since that time for testing and evaluation only. No seed sales were allowed.

## 24. CONTINUED FROM FRONT (Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).)

**NOTES:** It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. The fees for filing a change of address; owner's representative; ownership or assignment; or any modification of owner's name is specified in Section 97.175 of the regulations. (See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of the Regulations and Rules of Practice.)

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 1.4 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, sexual orientation, marital or family status, political beliefs, parental status, or protected genetic information. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call 202-720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

**EXHIBIT A - ORIGIN AND BREEDING HISTORY****'Grenora'**

Fall 1993

Original cross was made at North Dakota State University (NDSU) greenhouse.

Pedigree - D901260/D901419

D901260 - D8302/Sceptre  
 D8302 - D763/D73121/Vic  
 D763 - D7233/Edmore  
 D7233 - D6515/Ward  
 D6515 - Ld393/Yuma  
 D73121 - D65150/Leeds/Ward  
 D65150 - Pi/TM//2\*Tc/3/ZB/Wells  
 D901419 - Laker/D79209//D8012  
 D79209 - D7224/Cando  
 D7224 - D6530/D6654  
 D6530 - D56-1/Cappelli  
 D6654 - D61130/Leeds  
 D61130 - Lakota/DwF<sub>4</sub>/langdon  
 D8012 - D7075/Ward/Vic  
 D7075 - D62220/D57114//Leeds  
 D62220 - Ld357//Stewart/Ld357  
 D57114 - Ld357/CI7513

Spring 1994

F<sub>1</sub> plants, NDSU greenhouse.

Summer 1994

F<sub>2</sub> plants, NDSU research land.

Summer 1995

F<sub>3</sub> head rows, NDSU research land.

Summer 1996

F<sub>4</sub> head rows, NDSU research land.

Summer 1997

F<sub>5</sub> head rows, NDSU research land.

Summer 1998

F<sub>6</sub> preliminary yield trial, two locations, NDSU research land.  
 Experimental line designation - D97780.

Summer 1999

F<sub>7</sub> Advanced yield trial, two locations, NDSU research land.

Summer 2000

F<sub>8</sub> Elite yield trial, three locations, NDSU research land.

Summer 2001	F <sub>9</sub> Uniform Regional Durum Nursery, 13 locations, North Dakota, South Dakota, Minnesota, Montana, and Canada.
Summer 2002	F <sub>10</sub> Uniform Regional Durum Nursery, 13 locations, North Dakota, South Dakota, Minnesota, Montana, and Canada.
Summer 2003	F <sub>11</sub> Uniform Regional Durum Nursery, 13 locations, North Dakota, South Dakota, Minnesota, Montana, and Canada.
Fall-Spring 2004-05	Seed increase, Yuma, AZ.
Summer 2004	F <sub>12</sub> Uniform Regional Durum Nursery, 13 locations, North Dakota, South Dakota, Minnesota, Montana, and Canada.
Summer 2005	Second seed increase by Seedstocks Project.
June 1, 2005	D97780 was released as a named cultivar, Grenora.
Spring 2005	Grenora will be distributed to the North Dakota County Crop Improvement.

Grenora was observed for seven generations from 1998 to 2004 and was shown to be stable and uniform. Grenora has been rogued at the F<sub>6</sub> and subsequent generations. The frequency of rogued plants in each generation was less than 1/1000 plants. No variants were found in the variety Grenora.

The pedigree breeding method was used to develop Grenora. In early generations F<sub>2</sub> - F<sub>4</sub> high heritable traits such as plant height, maturity, and disease resistance were selected. Starting at F<sub>5</sub> generation when the genotype is highly fixed, selection criteria also included grain yield, test weight, kernel weight, and pasta quality traits (i.e., protein content, gluten strength, milling extraction, spaghetti color, cooking quality, etc.). Based on data from multiple locations and years Grenora was selected for its high yield, test weight and protein content and gluten strength. Grenora was selected as the experimental line D97780 in 1998 and was observed uniform and stable at the Preliminary Yield Trials, Advanced Yield Trials, Elite Yield Trials and the Uniform Regional Durum Nursery from 1998 through 2004.

Grain samples from quality drill strips grown at 19 site-years (2001 to 2003) were tested for durum wheat quality at North Dakota State University. The semolina extraction rate of Grenora was 64.8% on the Buhler-Miag laboratory mill at the Department of Cereal and Food Sciences, NDSU. Grenora has strong gluten mixing characteristics (classification: 7.0) as estimated by mixograph. Semolina protein of Grenora was 137 g kg<sup>-1</sup>. Pasta produced from Grenora has a color score of 9.2.

## EXHIBIT B - NOVELTY STATEMENT

To the best of my knowledge, Grenora most resembles Lebsock (durum wheat). This cultivar can be unambiguously differentiated at the molecular level using microsatellite markers according to Röder et al., 1998 Figure 1. The microsatellite loci we have used are described by Cregan and associates ([http://www.scabusa.org/pdfs/BARC\\_SSRs\\_011101.html](http://www.scabusa.org/pdfs/BARC_SSRs_011101.html)). DNA fragment analysis was carried out on 6% non-denaturing polyacrylamide gel using ethidium bromide to detect the DNA fragments as described by Shi et al (2001). The procedure was repeated to confirm reproducibility of the results.

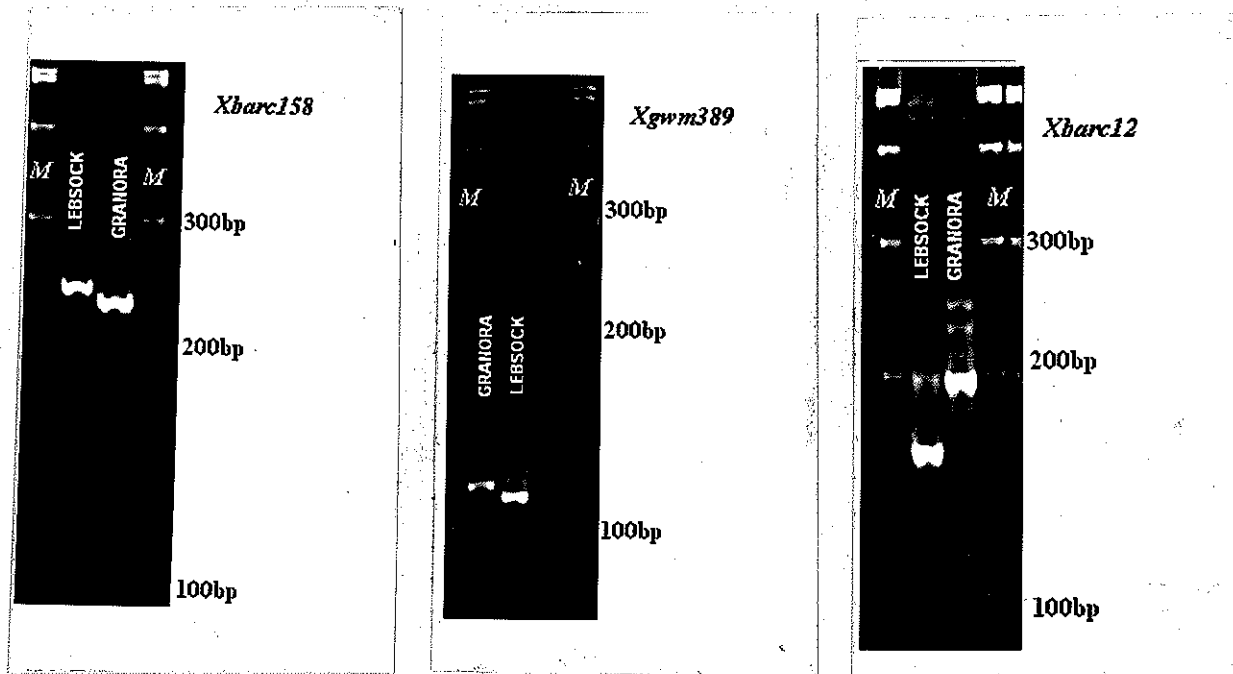


Figure 1: (A) Microsatellite *Xbarc158*. Grenora (lane 2) shows a band of ~ 230bp Whereas Lebsock (lane 1) shows a band of ~235bp. (B) Microsatellite *Xgwm389*. Grenora (lane 1) shows a band of ~ 121bp whereas Lebsock (lane 2) shows a band of ~115bp. (C) Microsatellite *Xbarc12*. Grenora (lane 2) shows a band of ~ 199bp whereas Lebsock (lane 1) shows a band of ~174bp. In all images M indicates a molecular weight marker.

## References:

Röder, M.S., V. Korzum, K. Wendehake, J. Plashke, M. Tixier, P. Leroy, and M.W. Ganal. 1998. A microsatellite of wheat. *Genetics* 149:207-2023.

Shi, J., Ward, R. and Wang, D. 2001. Application of a high throughput, low cost, non-denaturing polyacrylamide gel system for wheat microsatellite mapping. In *Natl. Fusarium Head Blight Forum*. Erlanger, KY. December 8-10, 2001. Edited by Canty, S.M., Lewis, J., Silver, L., and Ward, R.W. Kinko's Publisher, Okemos, MI.

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**U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE  
SCIENCE AND TECHNOLOGY  
PLANT VARIETY PROTECTION OFFICE  
BELTSVILLE, MD 20705**

Exhibit C

**OBJECTIVE DESCRIPTION OF VARIETY  
Wheat (*Triticum* spp.)**

NAME OF APPLICANT (S) NDSU Research Foundation	TEMPORARY OR EXPERIMENTAL DESIGNATION D97780	VARIETY NAME Grenora
ADDRESS (Street and No. or RD No., City, State, Zip Code and Country) NDSU Research Foundation 1735 NDSU Research Park Drive, PO Box 5002 Fargo, ND 58105-5002		FOR OFFICIAL USE ONLY PVPO NUMBER 200600107

**PLEASE READ ALL INSTRUCTIONS CAREFULLY:**

Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (e.g.,    or   ) when number is either 99 or less or 9 or less respectively. Data for quantitative plant characters should be based on a minimum of 100 plants. Comparative data should be determined from varieties entered in the same trial. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designate system used: \_\_\_\_\_ Please answer all questions for your variety; lack of response may delay progress of your application.

**1. KIND:**

- 1 = Common  
2 = Durum  
3 = Club  
4 = Other (Specify) \_\_\_\_\_

**2. VERNALIZATION:**

- 1 = Spring  
2 = Winter  
3 = Other (Specify) \_\_\_\_\_

**3. COLEOPTILE ANTHOCYANIN:**

- 1 = Absent                      2 = Present

**4. JUVENILE PLANT GROWTH:**

- 1 = Prostrate              2 = Semi-erect              3 = Erect

**5. PLANT COLOR: (boot stage)**

- 1 = Yellow-Green  
2 = Green  
3 = Blue-Green

**6. FLAG LEAF: (boot stage)**

- 1 = Erect                      2 = Recurved

- 1 = Not Twisted              2 = Twisted

- 1 = Wax Absent              2 = Wax Present

**7. EAR EMERGENCE:**

6 Number of Days (Average)

1 Number of Days Earlier Than

Same As

Number of Days Later Than

\* Mountrail

\* Lebsack

\* None

\*Relative to a PVPO-Approved Commercial Variety Grown in the Same Trial

**8. ANTHOR COLOR:**

- 1 = Yellow              2 = Purple

## 9. PLANT HEIGHT: (from soil to top of head, excluding awns)

0 8 1

cm (Average)

0 9

cm Taller Than

Plaza

Same As

None

0 3

cm Shorter Than

Lebsock

200600107

## 10. STEM:

## A. ANTHOCYANIN

1

1 = Absent 2 = Present

## B. WAXY BLOOM

1

1 = Absent 2 = Present

## C. HAIRINESS (last internode of rachis)

1

1 = Absent 2 = Present

## D. INTERNODE

3

1 = Hollow

2 = Semi-solid

3 = Solid

4

Number of Nodes

## E. PEDUNCLE

1

1 = Erect

2 = Recurved

3 = Semi-erect

1 9

cm Length

## F. AURICLE

1

Anthocyanin:

1 = Absent

2 = Present

1

Hair:

1 = Absent

2 = Present

## 11. HEAD: (At Maturity)

## A. DENSITY

2

1 = Lax

2 = Middense (Laxidense)

3 = Dense

## B. SHAPE

4

1 = Tapering

2 = Strap

3 = Clavate

4 = Other (Specify) Oblong

## C. CURVATURE

1

1 = Erect

2 = Inclined

3 = Recurved

## D. AWNEDNESS

4

1 = Awnless

2 = Apically Awnletted

3 = Awnletted

4 = Awned

## 12. GLUMES: (At Maturity)

## A. COLOR

1

1 = White

2 = Tan

3 = Other (Specify)

## B. SHOULDER

2

1 = Wanting

2 = Oblique

3 = Rounded

4 = Square

5 = Elevated

6 = Apiculate

7 = Other (Specify)

## C. SHOULDER WIDTH

2

1 = Narrow

2 = Medium

3 = Wide

## D. BEAK

3

1 = Obtuse

2 = Acute

3 = Acuminate

## E. BEAK WIDTH

2

1 = Narrow

2 = Medium

3 = Wide

## F. GLUME LENGTH

2

1 = Short (ca. 7mm)

2 = Medium (ca. 8mm)

3 = Long (ca. 9mm)

## G. WIDTH

2

1 = Narrow (ca. 3mm)

2 = Medium (ca. 3.5mm)

3 = Long (ca. 4mm)



## 13. SEED:

## A. SHAPE

- ☐ 3 1 = Ovate  
2 = Oval  
3 = Elliptical

## B. CHEEK

- ☐ 2 1 = Rounded  
2 = Angular

## C. BRUSH

- ☐ 1 1 = Short 1 = Not Collared  
2 = Medium 2 = Collared  
3 = Long

## D. CREASE

- ☐ 2 1 = Width 60% or less of Kernel  
2 = Width 80% or less of Kernel  
3 = Width Nearly as Wide as Kernel

- ☐ 1 1 = Depth 20% or less of Kernel  
2 = Depth 35% or less of Kernel  
3 = Depth 50% or less of Kernel

## E. COLOR

- ☐ 2 1 = White  
2 = Amber  
3 = Red  
4 = Other (Specify) \_\_\_\_\_

## F. TEXTURE

- ☐ 1 1 = Hard  
2 = Soft  
3 = Other (Specify) \_\_\_\_\_

## G. PHENOL REACTION (See Instructions)

- ☐ 1 1 = Ivory 4 = Dark Brown  
2 = Fawn 5 = Black  
3 = Light Brown

## H. SEED WEIGHT

- ☐ 3 ☐ 9 g/1000 Seed (Whole number only)

## I. GERM SIZE

- ☐ 3 1 = Small  
2 = Midsize  
3 = Large

## 14. DISEASE: PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

(0 = Not Tested 1 = Susceptible 2 = Resistant 3 = Intermediate 4 = Tolerant)

- |   |   |
|---|---|
| <input type="checkbox"/> 2 Stem Rust ( <i>Puccinia graminis</i> f. sp. <i>tritici</i> ) | <input type="checkbox"/> 2 Leaf Rust ( <i>Puccinia recondita</i> f. sp. <i>tritici</i> )                      |
| <input type="checkbox"/> 0 Stripe Rust ( <i>Puccinia striiformis</i> )                  | <input type="checkbox"/> 0 Loose Smut ( <i>Ustilago tritici</i> )   |
| <input type="checkbox"/> 3 Tan Spot ( <i>Pyrenophora tritici-repentis</i> )             | <input type="checkbox"/> 0 Flag Smut ( <i>Urocystis agropyri</i> )  |
| <input type="checkbox"/> 0 Halo Spot ( <i>Selenophoma donacis</i> )                     | <input type="checkbox"/> 0 Common Bunt ( <i>Tilletia tritici</i> or <i>T. laevis</i> )                        |
| <input type="checkbox"/> 3 <i>Septoria nodorum</i> (Glume Blotch)                       | <input type="checkbox"/> 0 Dwarf Bunt ( <i>Tilletia controversa</i> )   |
| <input type="checkbox"/> 0 <i>Septoria avenae</i> (Speckled Leaf Disease)               | <input type="checkbox"/> 0 Karnal Bunt ( <i>Tilletia indica</i> )   |
| <input type="checkbox"/> 3 <i>Septoria tritici</i> (Speckled Leaf Blotch)               | <input type="checkbox"/> 0 Powdery Mildew ( <i>Erysiphe graminis</i> f. sp. <i>tritici</i> )                  |
| <input type="checkbox"/> 3 Scab ( <i>Fusarium</i> spp.)                                 | <input type="checkbox"/> 0 "Snow Molds"   |
| <input type="checkbox"/> 0 "Black Point" (Kernel Smudge)                                | <input type="checkbox"/> 0 Common Root Rot ( <i>Fusarium</i> , <i>Cochliobolus</i> and <i>Bipolaris</i> spp.) |
| <input type="checkbox"/> 0 Barley Yellow Dwarf Virus (BYDV)                             | <input type="checkbox"/> 0 Rhizoctonia Root Rot ( <i>Rhizoctonia solani</i> )                                 |
| <input type="checkbox"/> 0 Soilborne Mosaic Virus (SBMV)                                | <input type="checkbox"/> 0 Black Chaff ( <i>Xanthomonas campestris</i> pv. <i>translucens</i> )               |
| <input type="checkbox"/> 0 Wheat Yellow (Spindle Streak) Mosaic Virus                   | <input type="checkbox"/> 0 Bacterial Leaf Blight ( <i>Pseudomonas syringae</i> pv. <i>syringae</i> )          |
| <input type="checkbox"/> 0 Wheat Streak Mosaic Virus (WSMV)                             | <input type="checkbox"/> Other (Specify) _____  |
| <input type="checkbox"/> Other (Specify) _____  | <input type="checkbox"/> Other (Specify) _____  |
| <input type="checkbox"/> Other (Specify) _____  | <input type="checkbox"/> Other (Specify) _____  |
| <input type="checkbox"/> Other (Specify) _____  | <input type="checkbox"/> Other (Specify) _____  |

## 15. INSECT: (0 = Not Tested 1 = Susceptible 2 = Resistant 3 = Intermediate 4 = Tolerant)

PLEASE SPECIFY BIOTYPE (where needed)

- |  |  |
|--|--|
| <input type="checkbox"/> 0 Hessian Fly ( <i>Mayetiola destructor</i> )   | <input type="checkbox"/> Other (Specify) _____ |
| <input type="checkbox"/> 0 Stem Sawfly ( <i>Cephus</i> spp.)             | <input type="checkbox"/> Other (Specify) _____ |
| <input type="checkbox"/> 0 Cereal Leaf Beetle ( <i>Oulema melanopa</i> ) | <input type="checkbox"/> Other (Specify) _____ |

15. INSECT: (continued)    0 = Not Tested    1 = Susceptible    2 = Resistant    3 = Intermediate    4 = Tolerant

PLEASE SPECIFY BIOTYPE (Where Needed)

200600107

- ☐ Russian Aphid (*Diuraphis noxia*)  
☐ Greenbug (*Schizaphis graminum*)  
☐ Aphids

- ☐ Other (Specify) \_\_\_\_\_  
☐ Other (Specify) \_\_\_\_\_  
☐ Other (Specify) \_\_\_\_\_



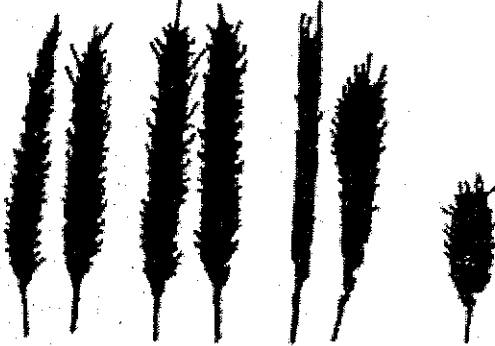




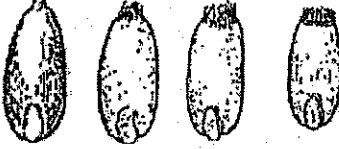
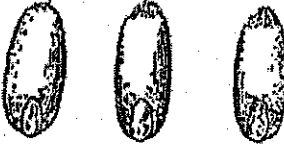



16. ADDITIONAL INFORMATION ON ANY ITEM ABOVE, OR GENERAL COMMENTS:

# WHEAT DESCRIPTOR ILLUSTRATIONS

Exhibit C (Wheat)

Section Numbers Correspond to the Numbers of the Sections on the Form

200600107

<p>4. EARLY PLANT GROWTH HABIT:</p>  <p>1 Prostrate      2 Intermediate      3 Erect</p>	<p>10. STEM INTERNODE X-SECTION:</p>  <p>1 Hollow      2 Semi-solid      3 Solid</p>	<p>11. SPIKE SHAPE:</p>  <p>1 Tapering      2 Oblong      3 Clavate      4 Elliptical</p>	
<p>11. AWNEDNESS:</p>  <p>1 Awnless      2 Apically Awnleted      3 Awnleted      4 Awned</p>	<p>12. BEAK SHAPE:</p>  <p>1 Obtuse      2 Acute      3 Acuminate</p>		
<p>13. SEED SHAPE:</p>  <p>1 Ovate      2 Oval      3 Elliptical</p>	<p>13. CHEEK SHAPE:</p>  <p>1 Rounded      2 Angular</p>	<p>13. BRUSH SIZE</p>  <p>1 Small      2 Midsized      3 Large      4 Collared</p>	<p>13. BRUSH HAIR LENGTH:</p>  <p>1 Short      2 Medium      3 Long</p>
<p>13. GERM (EMBRYO) SIZE:</p>  <p>1 Small      2 Midsized      3 Large</p>	<p>13. SEED CREASE WIDTH:</p>  <p>1 Narrow      2 Mid-wide      3 Wide</p>	<p>13. SEED CREASE DEPTH:</p>  <p>1 Shallow      2 Mid-Deep      3 Deep</p>	

U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). The information is held confidential until the certificate is issued (7 U.S.C. 2426).

**EXHIBIT E**  
**STATEMENT OF THE BASIS OF OWNERSHIP**

1. NAME OF APPLICANT(S)  NDSU Research Foundation	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER  D97780	3. VARIETY NAME  'Grenora'
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP, and Country)  C/O Executive Director 1735 NDSU Research Park Drive PO Box 5002 Fargo, ND 58105-5002	5. TELEPHONE (Include area code)  (701) 231-8931	6. FAX (Include area code)  (701) 231-6661
7. PVPO NUMBER  <b>200600107</b>		

8. Does the applicant own all rights to the variety? Mark an "X" in the appropriate block. If no, please explain.



YES



NO

9. Is the applicant (individual or company) a U.S. national or a U.S. based company? If no, give name of country.



YES



NO

10. Is the applicant the original owner?



YES



NO

If no, please answer one of the following:

a. If the original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. National(s)?



YES



NO

If no, give name of country

b. If the original rights to variety were owned by a company(ies), is (are) the original owner(s) a U.S. based company?



YES



NO

If no, give name of country

11. Additional explanation on ownership (Trace ownership from original breeder to current owner. Use the reverse for extra space if needed):

**PLEASE NOTE:**

Plant variety protection can only be afforded to the owners (not licensees) who meet the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed the final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definitions.

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 0.1 hour per response, including the time for reviewing the instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, sexual orientation, marital or family status, political beliefs, parental status, or protected genetic information. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, D.C. 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

**EXHIBIT E - STATEMENT OF THE BASIS OF THE APPLICANT'S OWNERSHIP**

Dr. Elias M. Elias, an employee of the North Dakota Agricultural Experiment Station and North Dakota State University, is a plant breeder who developed 'Grenora' the durum wheat cultivar for which Plant Variety Protection is hereby sought. The employee by agreement and because of the condition of the use of facilities and funds of the North Dakota Agricultural Experiment Station and North Dakota State University has assigned all ownership rights to 'Grenora' durum wheat to the North Dakota Agricultural Experiment Station and North Dakota State University.

North Dakota State University on behalf of the North Dakota Agricultural Experiment Station has assigned all ownership to the NDSU Research Foundation. The NDSU Research Foundation is a nonprofit corporation set up to own and manage the intellectual property of North Dakota State University.